

JPD (QM) TEST PLAN
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I. List of the Tests.

1. Environmental Stress Screening (ESS) Test.

Setup block diagram: see figure 1 “Setup block diagram for JPD (QM) ESS Tests” and figure 9 “Grounding scheme for JPD ESS Test”.

Test Equipment: Z and X & Y axes vibration tables with accessories, thermal chamber.

Plan for equipment placement: see figure 2 “ESS (Vibration) tests facility equipment placement” and figure 3 “ESS (Thermal) tests facility equipment placement”.

Location of the test facility: CSIST (Taiwan).

1.1. Sine wave sweeping test.

Objective: to confirm conformity of mechanical characteristics JPD to the NASA requirements.

Stress requirements and screening parameters: NASA Document 740-SPEC-008.

Stress exposure time: 2 minutes for each of direction.

Conditions: JPD and active loads are stay in Power OFF mode.

Applicable test procedures: none.

Expected duration of the test: 30 minutes.

1.2. Random vibration test.

Objective: to confirm immunity and serviceability of JPD while applying the stress.

Stress requirements: NASA-STD-7001.

Stress exposure time: 10 minutes for each of direction.

Test procedures and vibration profile synchronization scheme:

Conditions: JPD and active loads should be configured according to requirements for each of test procedures.

Applicable test procedures:

1. Power On state

Expected duration of the test: 30 minutes.

1.3. Thermal cycling test.

Objective: to confirm serviceability of JPD in specified temperature range.

Stress requirements and exposure time: according to document “Test Procedures for J-Crate (QM) Environmental Tests V2.0”

Conditions: JPD and active loads should be configured according to requirements for each of test procedures. . Before test JPD, 28V power supplies, and active loads should be powered on for self-heating at 30 minutes.

Applicable test procedures:

1. Power On State
2. Short circuit protection
3. Line regulation
4. Load regulation
10. Voltage and Current Monitoring

Expected duration of the test: 90 minutes.

1.4. Mechanical durability test.

Objective: to confirm mechanical durability of JPD.

Stress requirements and screening parameters: NASA Document 740-SPEC-008.

Stress exposure time: 2 minutes for each of direction.

Conditions: JPD and active loads are stay in Power OFF mode.

Applicable test procedures: none.

Expected duration of the test: 30 minutes.

2. Thermo Vacuum Test (TVT).

Setup block diagram: see to figure 4 “Setup block diagram for JPD (QM) TVT Tests”.

Test Equipment: TVT Chamber (NSPO).

Plan for equipment placement: see figure 5 “TVT tests facility equipment placement”.

Location of the TVT facility: NSPO (Taiwan).

Test Condition: according to document “Test Procedures for J-Crate (QM) Environmental Tests V2.0”

Test program: *to support test program for J and JT crates (there is no dedicated test program for JPD QM).*

3. Electro Magnetic Compatibility (EMC) Test.

Setup block diagram: see figure 6 “Setup block diagram for JPD (QM) EMC Test”.

Test Equipment: EMC Test Chamber.

Plan for equipment placement: see figure 7 “EMC tests facility equipment placement”.

Location of the test facility: CSIST (Taiwan)

Test Condition: according to document “AMS-02 QM J-crate Thermal Vacuum/ Thermal Balance Test Procedure”

Test program: *to support test program for J and JT crates (there is no dedicated test program for JPD QM).*

II. Description of the Test Procedures.

1. Power ON State Test Procedure.

Objective: Check of reliability power on reset circuit, which sets DC-DC converters in predefined state while Power ON time.

Setup conditions: both 28V power supplies should be powered OFF; all active loads should be powered ON; active loads should be configured according to table 2 “Active Loads Parameters. Nominal Load”. For measurement of voltages and currents should be used dedicated service in HP60501B active loads and 28V power supplies. Test should be done with 3 different configurations:

- 28V Feed A is ON and 28V Feed B is OFF;
- 28V Feed A is OFF and 28V Feed B is ON;
- 28V Feed A is ON and 28V Feed B is ON

Order of actions:

- 1.1 Measure and write to log file voltages and currents in both 28V feeds.
- 1.2 Measure and write to log file voltages and currents at loads.
- 1.3 Wait random time interval (from 0 to 90 seconds) and write it value to log file.
- 1.4 Turn ON selected 28V feeds.
- 1.5 Waite 30 seconds.
- 1.6 Measure and write to log file voltages and currents at loads.
- 1.7 Read data from JPD control and status registers and write these data to log file.
- 1.8 Read data from all Dallas sensors and write these data to log file.
- 1.9 Turn OFF selected 28V power supplies.
- 1.10 Repeat 3 times items from 1.1 to 1. 9.

Expected duration of the test: 10 minutes.

2. Short Circuit Protection Test Procedure.

Objective: Check serviceability of all subsystems in JPD with short circuit **in one of loads**; check thermal conditions in JPD with continuous overload **in one of loads**.

Setup conditions: both 28V power supplies should to powered OFF; all active loads should be powered ON; active loads should be configured according to table 2 “Active Loads Parameters. Nominal Load”. For measurement of voltages and currents should be used dedicated services in HP60501B active loads and 28V power supplies.

Order of actions:

- 2.1 Turn ON both 28V power supplies.
 - 2.2 Waite 30 seconds.
 - 2.3 Measure and write to log file voltages and currents at all loads.
 - 2.4 Read data from JPD control and status registers and write these data to log file.
 - 2.5 Read data from all Dallas sensors and write these data to log file.
 - 2.6 Change configuration for active load [#1] to programmable short circuit mode.
 - 2.7 Waite 30 seconds.
 - 2.8 Measure and write to log file voltages and currents at all loads.
 - 2.9 Read data from JPD control and status registers and write these data to log file.
 - 2.10 Read data from all Dallas sensors and write these data to log file.
 - 2.11 Waite 10 seconds.
 - 2.12 Repeat 3 times items from 2.8 to 2.11.
 - 2.13 Turn OFF overloaded DC-DC converter (if applicable).
 - 2.14 Waite 30 seconds.
 - 2.15 Measure and write to log file voltages and currents at all loads.
 - 2.16 Read data from JPD control and status registers and write these data to log file.
-

- 2.17 Read data from all Dallas sensors and write these data to log file.
- 2.18 Change selected active load configuration to nominal load limit according to table 2 “Active Loads Parameters. Nominal Load”.
- 2.19 Turn ON DC-DC converter, which was turned off before (if applicable).
- 2.20 Waite 30 seconds.
- 2.21 Measure and write to log file voltages and currents at all loads.
- 2.22 Read data from JPD control and status registers and write these data to log file.
- 2.23 Read data from all Dallas sensors and write these data to log file.
- 2.24 Proceed items from 2.6 to 2.23 for the loads #2 - #22
- 2.25 Change active loads configuration according to table 2 “Active Loads Parameters. Nominal Load”.
- 2.26 Turn OFF both 28V power supplies.

Expected duration of the test: 20 minutes.

3. Line Regulation Test Procedure.

Objective: Check serviceability of all JPD subsystems in range of input voltage 18V – 38V.

Setup conditions: both 28V power supplies should to powered OFF; all active loads should be powered ON; active loads should be configured according to 1 “Active Loads Parameters. Nominal Load”. For measurement of voltages and currents should be used dedicated services in HP60501B active loads and 28V power supplies.

Order of actions:

- 3.1 Turn ON both 28V power supplies.
- 3.2 Waite 30 seconds.
- 3.3 Measure and write to log file voltages and currents at all loads.
- 3.4 Read data from JPD control and status registers and write these data to log file.
- 3.5 Read data from all Dallas sensors and write these data to log file.
- 3.6 Set 28V power supplies outputs to 18.0V.
- 3.7 Repeat 3 times items from 3.2 to 3.5.
- 3.8 Set 28V power supplies outputs to 28.0V.
- 3.9 Repeat 3 times items from 3.2 to 3.5.
- 3.10 Set 28V power supplies outputs to 38.0V.
- 3.11 Repeat 3 times items from 3.2 to 3.5.
- 3.12 Set 28V power supplies outputs to 28.0V.
- 3.13 Turn OFF both 28V power supplies.

Expected duration of the test: 10 minutes.

4. Load Regulation Test Procedure.

Objective: Check serviceability of all JPD subsystems in range of load limits.

Setup conditions: both 28V power supplies should to powered OFF; all active loads should be powered ON; active loads should be configured according to table 2 “Active Loads Parameters. Nominal Load”. For measurement of voltages and currents should be used dedicated services in HP60501B active loads and 28V power supplies. Test should be done with 3 different configurations:

- 28V Feed A is ON and 28V Feed B is OFF;
- 28V Feed A is OFF and 28V Feed B is ON;
- 28V Feed A is ON and 28V Feed B is ON

Order of actions:

- 4.1 Turn ON selected 28V power Feed[s].
 - 4.2 Waite 30 seconds.
-

- 4.3 Measure and write to log file voltages and currents at all loads.
- 4.4 Read data from JPD control and status registers and write these data to log file.
- 4.5 Read data from all Dallas sensors and write these data to log file.
- 4.6 Repeat 3 times items from 4.2 to 4.5.
- 4.7 Change active loads configuration according to table 2 “Active Loads Parameters. Minimal Load”.
- 4.8 Repeat 3 times items from 4.2 to 4.5.
- 4.9 Change active loads configuration according to table 2 “Active Loads Parameters. Maximal Load”.
- 4.10 Repeat 3 times items from 4.2 to 4.5.
- 4.11 Change active loads configuration according to table 2 “Active Loads Parameters. Nominal Load”.
- 4.12 Turn OFF selected 28V power Feed[s].

Expected duration of the test: 20 minutes.

5. Ripples Amplitude Check Procedure.

Objective: Check amplitude of ripples for all JPD output channels under minimal, nominal, and maximal loads.

Setup conditions: both 28V power supplies should to powered OFF; all active loads should be powered ON; active loads should be configured according to table 2 “Active Loads Parameters. Maximal Load”. For measurement of voltages and currents should be used dedicated services in HP60501B active loads and 28V power supplies. For measurement of ripples amplitude should be used oscilloscope.

Order of actions:

- 5.1 Turn ON both 28V power supplies.
- 5.2 Turn ON oscilloscope; set oscilloscope parameters as follow: trigger mode: auto, trigger source: CH1, input mode: ac coupled, vertical resolution: 100mV/div, horizontal resolution: 100mS/div, measurement system mode: automatic waveform measurement peak-to-peak mode.
- 5.3 Connect CH1 probe of oscilloscope to the inputs of load [#1] from table 2.
- 5.4 Measure and write to log file voltage and current at selected load.
- 5.5 Measure amplitude of ripples for selected load.
- 5.6 Write collected data to log file.
- 5.7 Repeat items from 5.4 to 5.6 for loads #2 - #22, which are listed in table 2.
- 5.8 Change active loads configuration according to table 2 “Active Loads Parameters. Nominal Load”.
- 5.9 Turn OFF both 28V power supplies.
- 5.10 Turn OFF oscilloscope.

Expected duration of the test: 30 minutes.

6. Inrush Current Check Procedure.

Objective: Check inrush current for JPD inputs.

Setup conditions: both 28V power supplies should to powered OFF; all active loads should be powered ON; active loads should be configured according to table 2 “Active Loads Parameters. Nominal Load”. For measurement of inrush current value should be used oscilloscope.

Order of actions:

- 6.1 Turn ON oscilloscope; set oscilloscope parameters as follow: trigger mode: single sequence, trigger source: CH1, trigger level 50mV, input mode: dc coupled, vertical

resolution: 0.5V/div, horizontal resolution: 10mS/div, measurement system mode: automatic waveform measurement peak-to-peak mode.

6.2 Plug current shunt to 28V-A power supply, as it is shown at figure 1.

6.3 Connect CH1 probe of oscilloscope to the current shunt.

6.4 Clear data memory and trigger in oscilloscope.

6.5 Turn ON 28V-A power supply.

6.6 Waite 1 second.

6.7 Measure amplitude of signal for selected power supply.

6.8 Write data to log file.

6.9 Turn OFF 28V-A power supply.

6.10 Unplug current shunt from 28V-A power supply.

6.11 Plug current shunt to 28V-B power supply, as it is shown at figure 1.

6.12 Connect CH1 probe of oscilloscope to the current shunt.

6.13 Clear data memory and trigger in oscilloscope.

6.14 Turn ON 28V-B power supply.

6.15 Waite 1 second.

6.16 Measure amplitude of signal for selected power supply.

6.17 Write data to log file.

6.18 Turn OFF 28V-B power supply.

6.19 Unplug current shunt from 28V-B power supply.

Expected duration of the test: 5 minutes.

7. CAN Bus Read / Write Operations Test.

Objective: Confirm reliability of JPD (USCM) CAB-Bus interface.

Setup conditions: both 28V power supplies should be powered OFF; all active loads should be powered ON; active loads should be configured according to table 2 “Active Loads Parameters. Nominal Load”. For measurement of voltages and currents should be used dedicated service in HP60501B active loads and 28V power supplies.

Order of actions:

7.1 Turn ON both 28V power supplies.

7.2 Waite 30 seconds.

7.3 Measure and write to log file voltages and currents at all loads.

7.4 Read all 32 analog channels for selected USCM[s].

7.4 Read data from JPD control and status registers through selected USCM and write these data to log file.

7.5 Read data from all Dallas sensors through selected USCM and write these data to log file.

7.6 Turn OFF both 28V power supplies.

Note: Items 7.2 – 7.5 should be completed for the 8 different configurations:

- USCM-A is ON, USCM-B is OFF
 - USCM-A / CAN bus A is active;
 - USCM-A / CAN bus B is active;
- USCM-A is OFF, USCM-B is ON
 - USCM-B / CAN bus A is active;
 - USCM-B / CAN bus B is active;
- USCM-A is ON, USCM-B is ON
 - USCM-A / CAN bus A is active;
 - USCM-A / CAN bus B is active;
 - USCM-B / CAN bus A is active;

- USCM-B / CAN bus B is active;

Expected duration of the test: 30 minutes.

8. LVDS Bus Read / Write Operations Test.

Objective: Confirm reliability of JPD LVDS Bus interface.

Setup conditions: both 28V power supplies should be powered OFF; all active loads should be powered ON; active loads should be configured according to table 2 “Active Loads Parameters. Nominal Load”. For measurement of voltages and currents should be used dedicated service in HP60501B active loads and 28V power supplies.

Order of actions:

- 8.1 Turn ON both 28V power supplies.
- 8.2 Waite 30 seconds.
- 8.3 Measure and write to log file voltages and currents at all loads.
- 8.4 Read data from JPD control and status registers and write these data to log file.
- 8.5 Read data from all Dallas sensors and write these data to log file.
- 8.6 Turn OFF all DC-DC converters.
- 8.7 Waite 10 seconds.
- 8.8 Measure and write to log file voltages and currents at all loads.
- 8.9 Read data from JPD control and status registers and write these data to log file.
- 8.10 Read data from all Dallas sensors and write these data to log file.
- 8.11 Repeat 3 times items from 8.2 to 8.10.
- 8.12 Turn ON all DC-DC converters.
- 8.13 Waite 10 seconds.
- 8.14 Measure and write to log file voltages and currents at all loads.
- 8.15 Read data from JPD control and status registers and write these data to log file.
- 8.16 Read data from all Dallas sensors and write these data to log file.
- 8.17 Turn OFF both 28V power supplies.

Note: Items 8.1 – 8.17 should be completed for the 8 different configurations:

- USCM-A is ON, USCM-B is OFF
 - USCM-A / CAN bus A is active;
 - USCM-A / CAN bus B is active;
- USCM-A is OFF, USCM-B is ON
 - USCM-B / CAN bus A is active;
 - USCM-B / CAN bus B is active;
- USCM-A is ON, USCM-B is ON
 - USCM-A / CAN bus A is active;
 - USCM-A / CAN bus B is active;
 - USCM-B / CAN bus A is active;
 - USCM-B / CAN bus B is active;

Expected duration of the test: 30 minutes.

9. Dallas Bus Read / Write Operations Test.

Testing of Dallas Bus Read/Write operations is included in all functional tests and can be omitted as a separate test procedure. During ESS test only bus #1 (JPD internal) will be tested. Dallas buses 2 and 3 read/write operations will be tested in Lab before ESS with using USCM firmware (sensors readout through TTY line).

10. Voltage and Current Monitoring Test.

Objective: Confirm reliability and accuracy of JPD current and voltage monitoring subsystem.

Setup conditions: both 28V power supplies should be powered OFF; all active loads should be powered ON; active loads should be configured according to table 2 “Active Loads Parameters. Nominal Load”. For measurement of voltages and currents should be used dedicated service in HP60501B active loads and 28V power supplies. Appropriation between active loads and ADC channels is shown in table 3 “ADC channels assignment”.

Order of actions:

- 10.1 Turn ON both 28V power supplies.
- 10.2 Set current limit for all active loads to 0 Amps.
- 10.3 Waite 30 seconds.
- 10.4 Measure voltage and current at selected active load [#1].
- 10.5 Read measured voltage and current for selected load from appropriate ADC channels of USCM-A.
- 10.6 Read measured voltage and current for selected load from appropriate ADC channels of USCM-B.
- 10.7 Write measured in items 10.4 - 10.6 values in log file.
- 10.8 Repeat items 10.4 – 10.7 5 times.
- 10.9 Repeat items 10.4 – 10.8 for loads #2 - #22.
- 10.10 Read data from all Dallas sensors and write these data to log file.
- 10.11 Increase current limit for each of active load at 25% from nominal load.
- 10.12 Repeat items 10.3 – 10.11 until current limit for each of loads will not reached 125% from nominal load.
- 10.13 Set current limit for all active loads to 0 Amps.
- 10.14 Turn OFF USCM-B.
- 10.15 Measure voltage and current at selected active load [#1].
- 10.16 Read measured voltage and current for selected load from appropriate ADC channels of USCM-A.
- 10.17 Write measured in items 10.15 - 10.16 values in log file.
- 10.18 Repeat items 10.15 – 10.17 5 times.
- 10.19 Repeat items 10.15 – 10.18 for loads #2 - #22.
- 10.20 Repeat items 10.15 – 10.19 until current limit for each of loads will not reached 125% from nominal load.
- 10.21 Set current limit for all active loads to 0 Amps.
- 10.22 Turn ON USCM-B.
- 10.23 Turn OFF USCM-A.
- 10.24 Measure voltage and current at selected active load [#1].
- 10.25 Read measured voltage and current for selected load from appropriate ADC channel of USCM-B.
- 10.26 Write measured in items 10.25 - 10.25 values in log file.
- 10.27 Repeat items 10.24 – 10.26 5 times.
- 10.28 Repeat items 10.24 – 10.27 for loads #2 - #22.
- 10.29 Repeat items 10.24 – 10.28 until current limit for each of loads will not reached 125% from nominal load.
- 10.30 Turn ON USCM-A.
- 10.31 Set current limit for all active loads to Nominal Load value.
- 10.32 Turn OFF both 28V power supplies.

Expected duration of the test: 30 minutes.

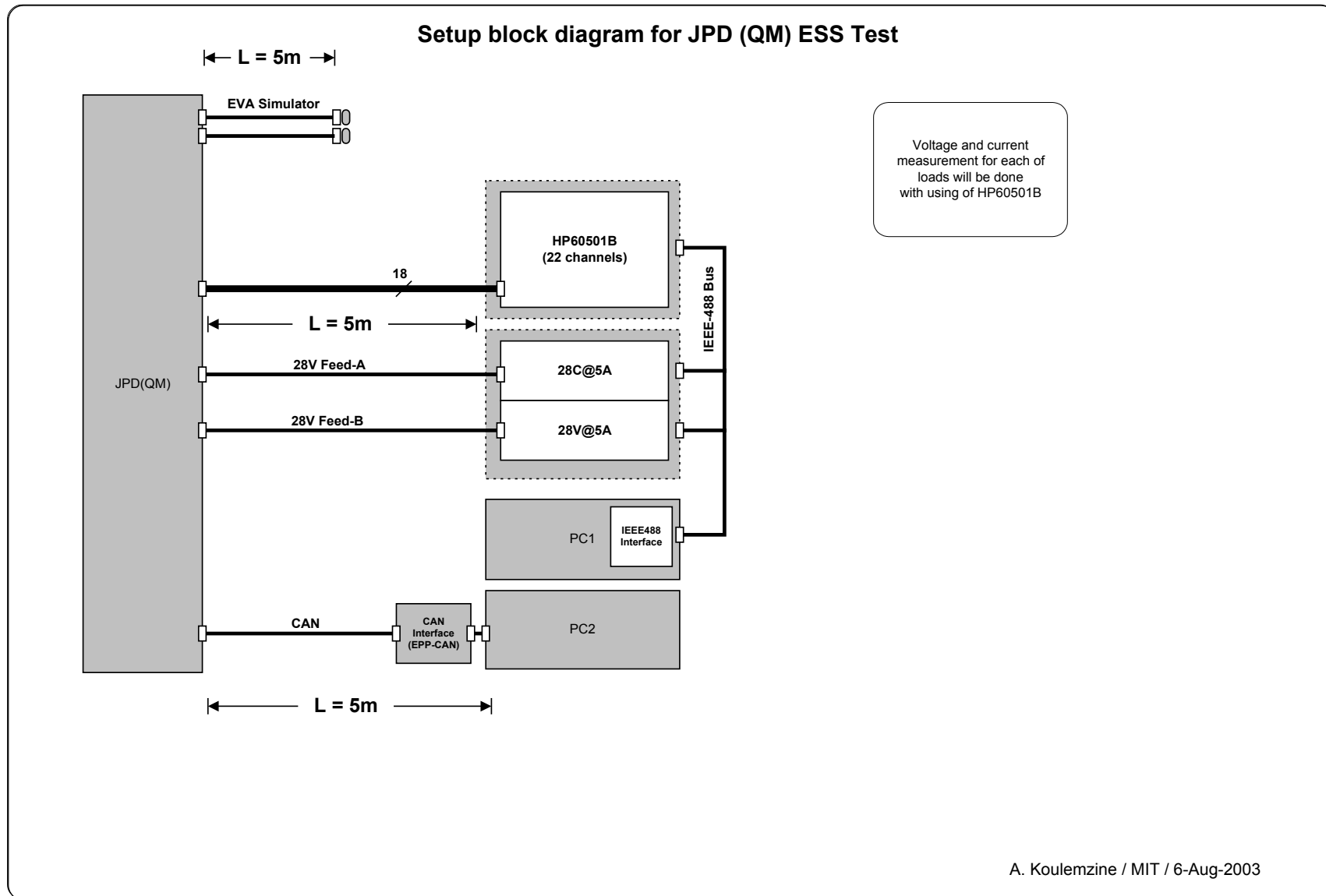


Figure 1. Setup block diagram for JPD (QM) ESS Tests.

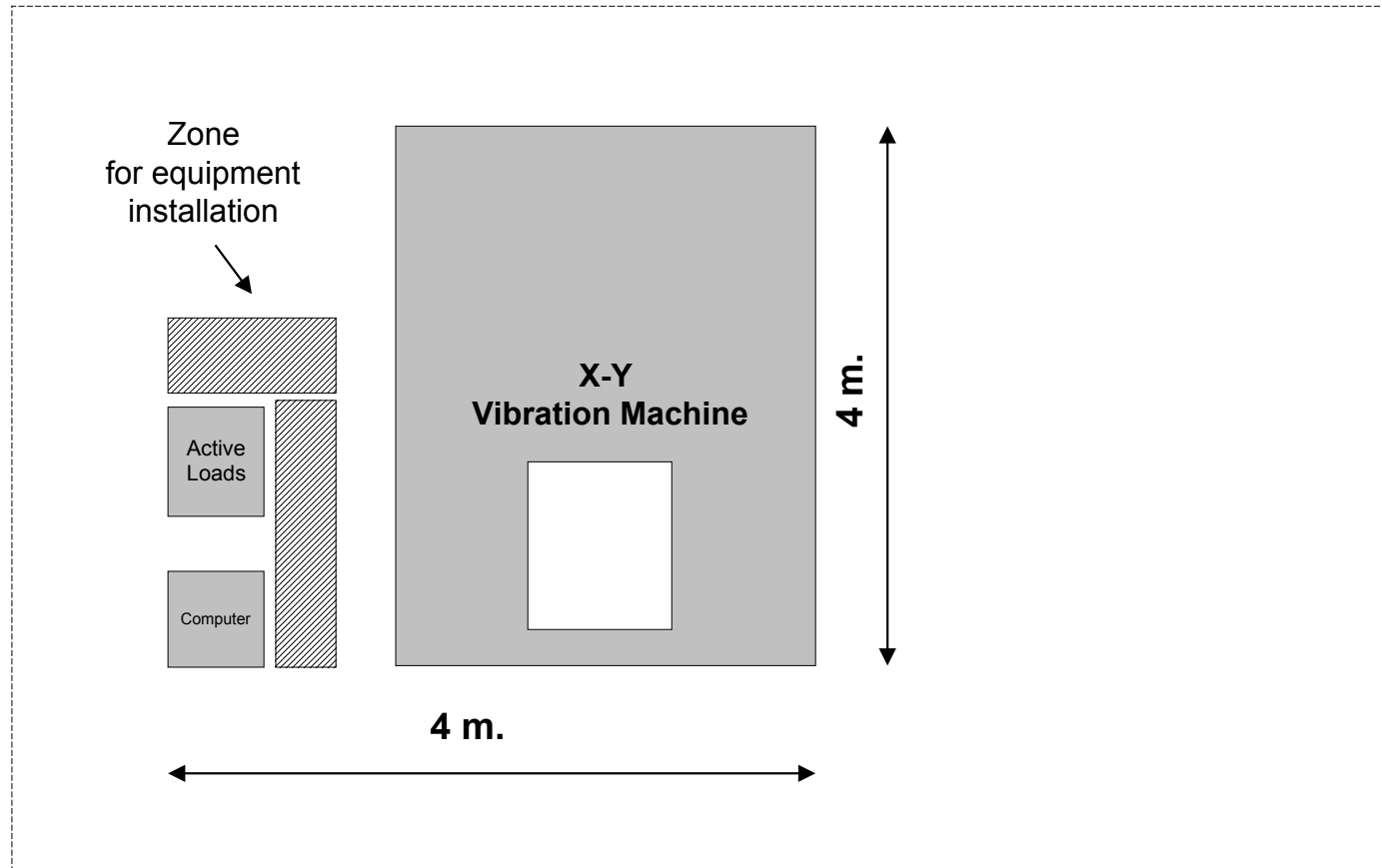


Figure 2. ESS (Vibration) tests facility equipment placement.

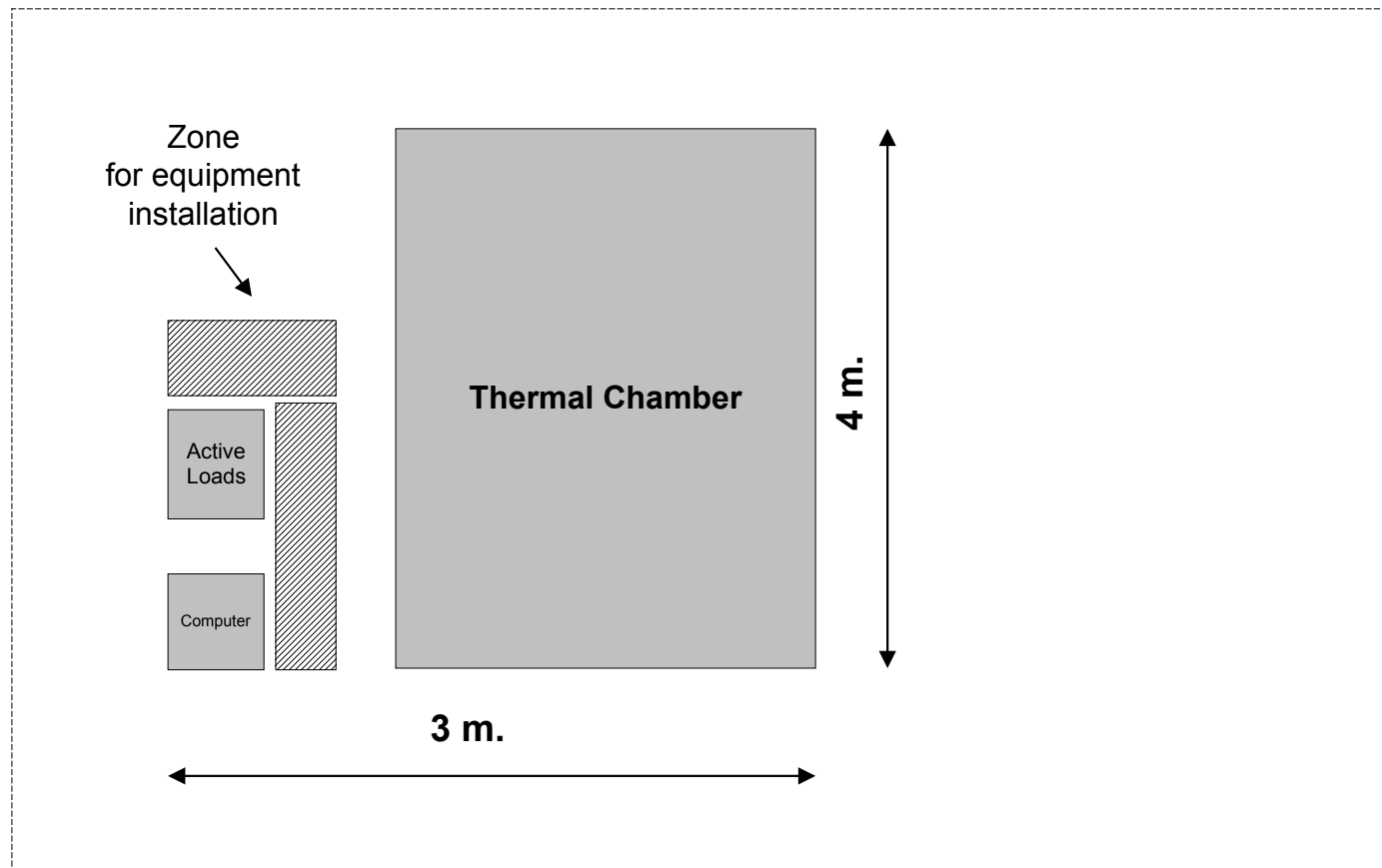


Figure 3. ESS (Thermal) tests facility equipment placement.

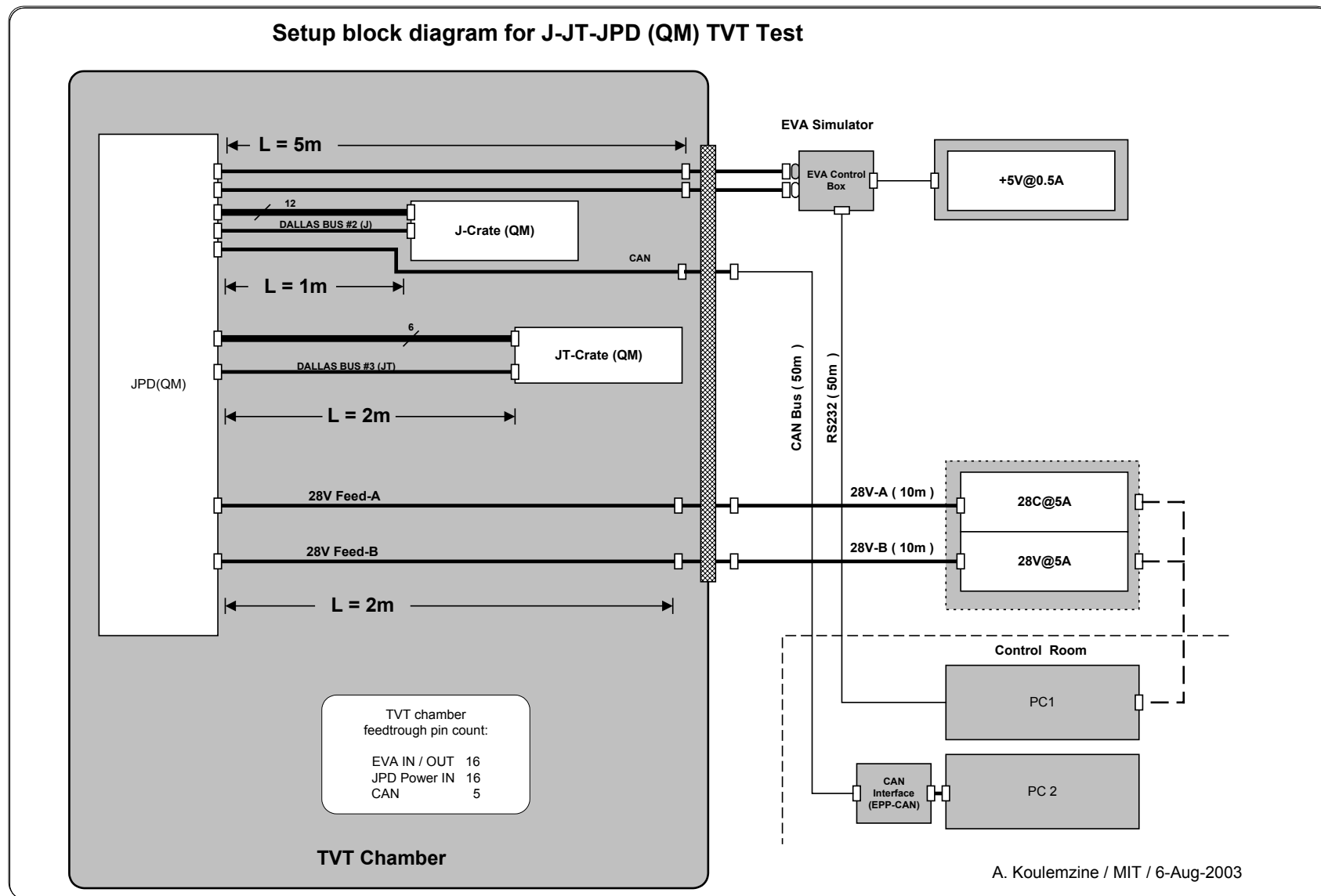


Figure 4. Setup block diagram for JPD (QM) TVT.

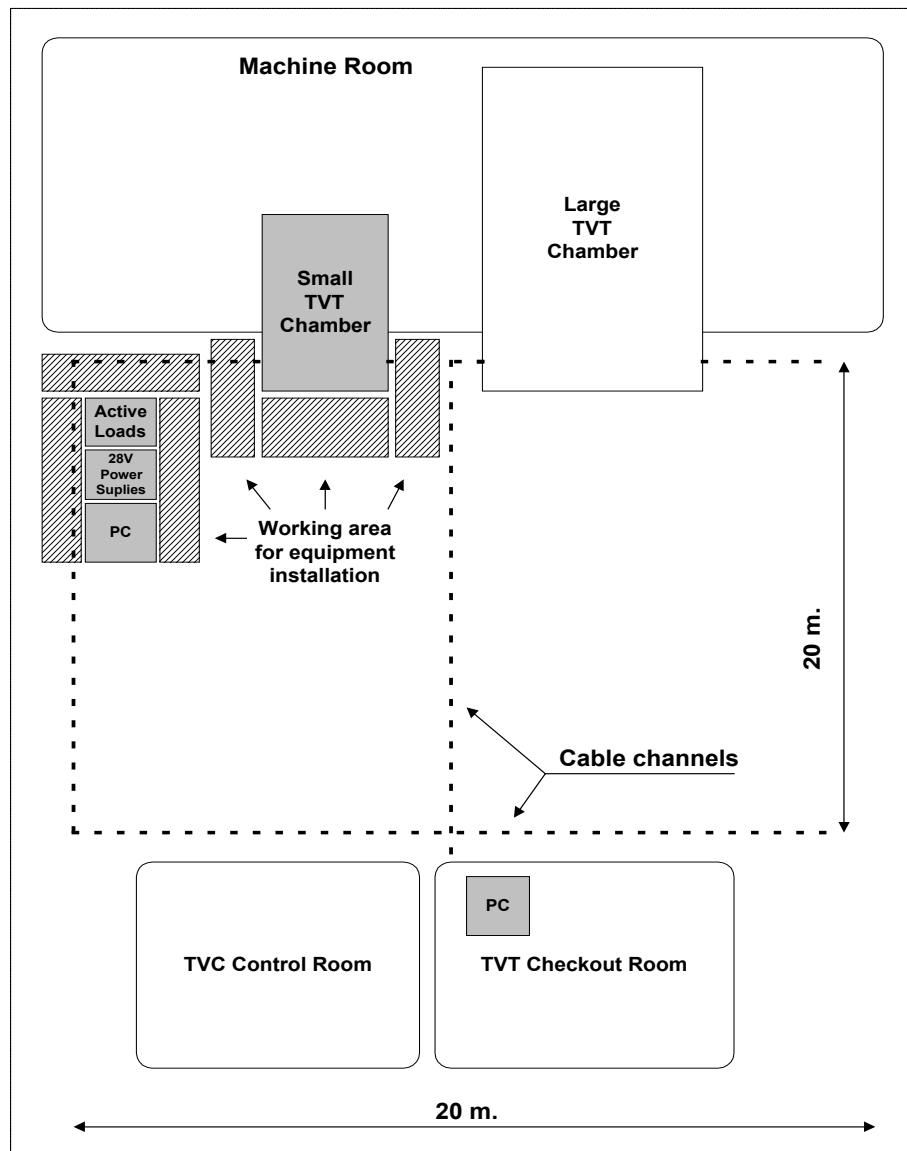


Figure 5. TVT facility equipment placement.

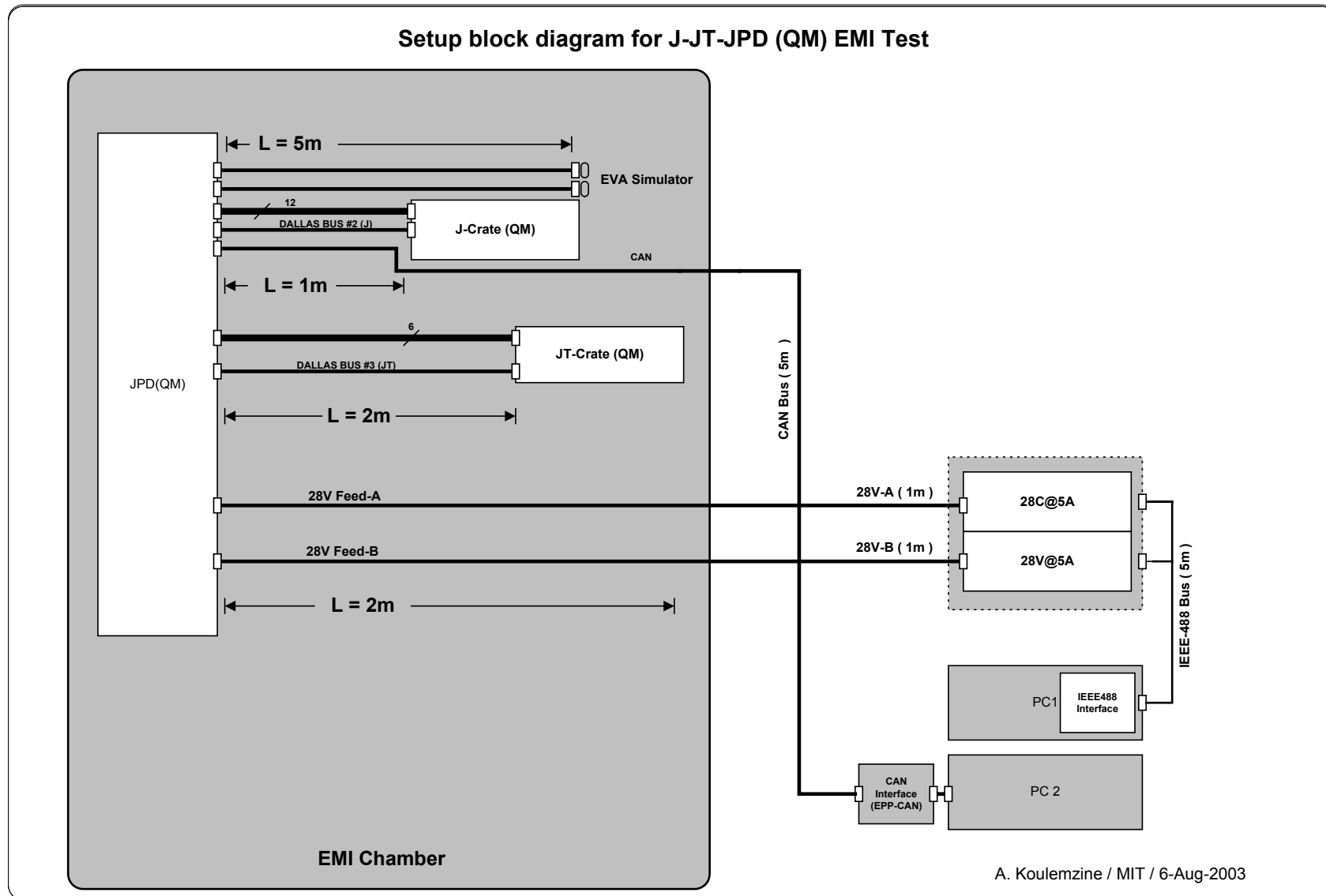


Figure 6. Setup block diagram for JPD (QM) EMC Test.

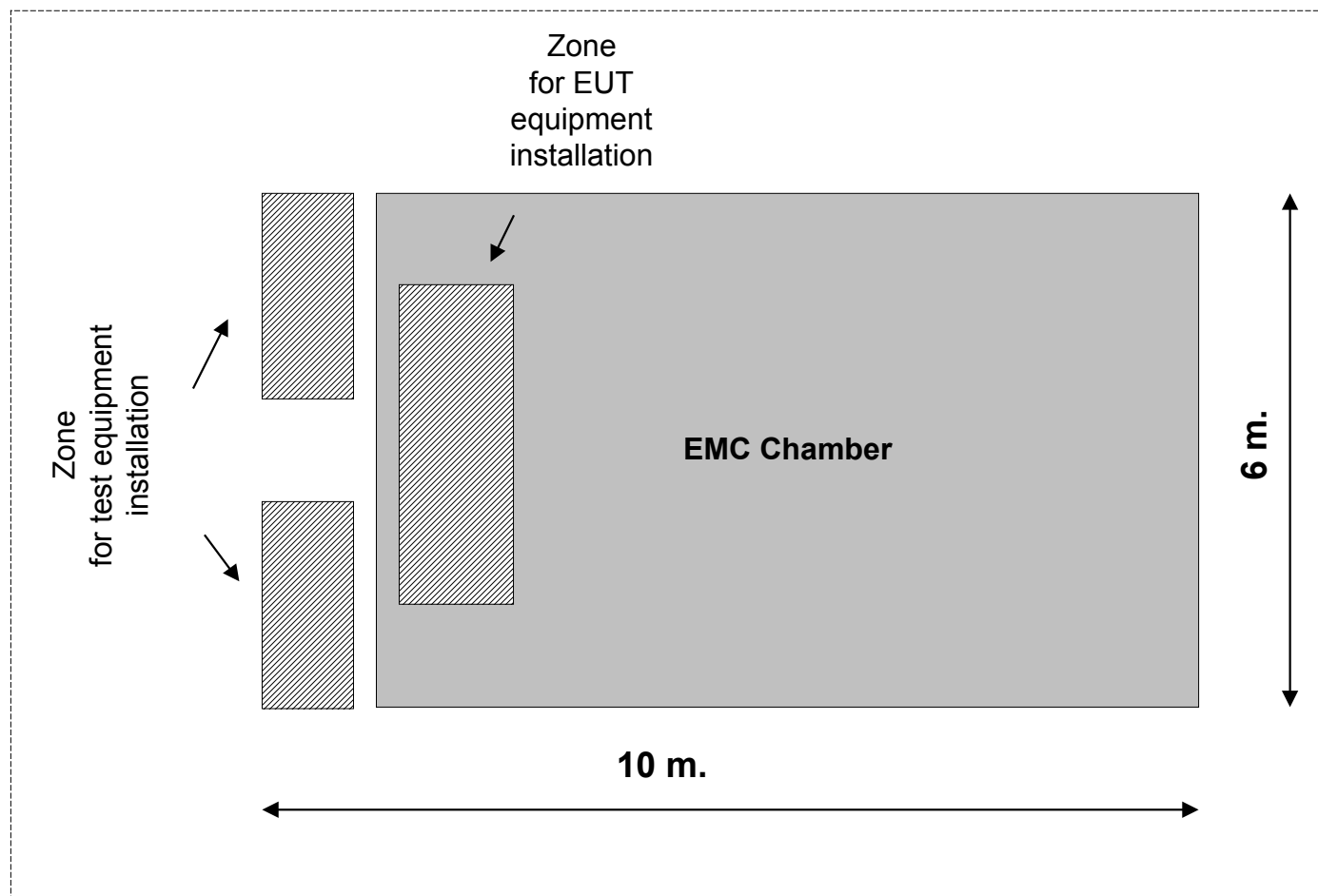


Figure 7. EMC test facility equipment placement.

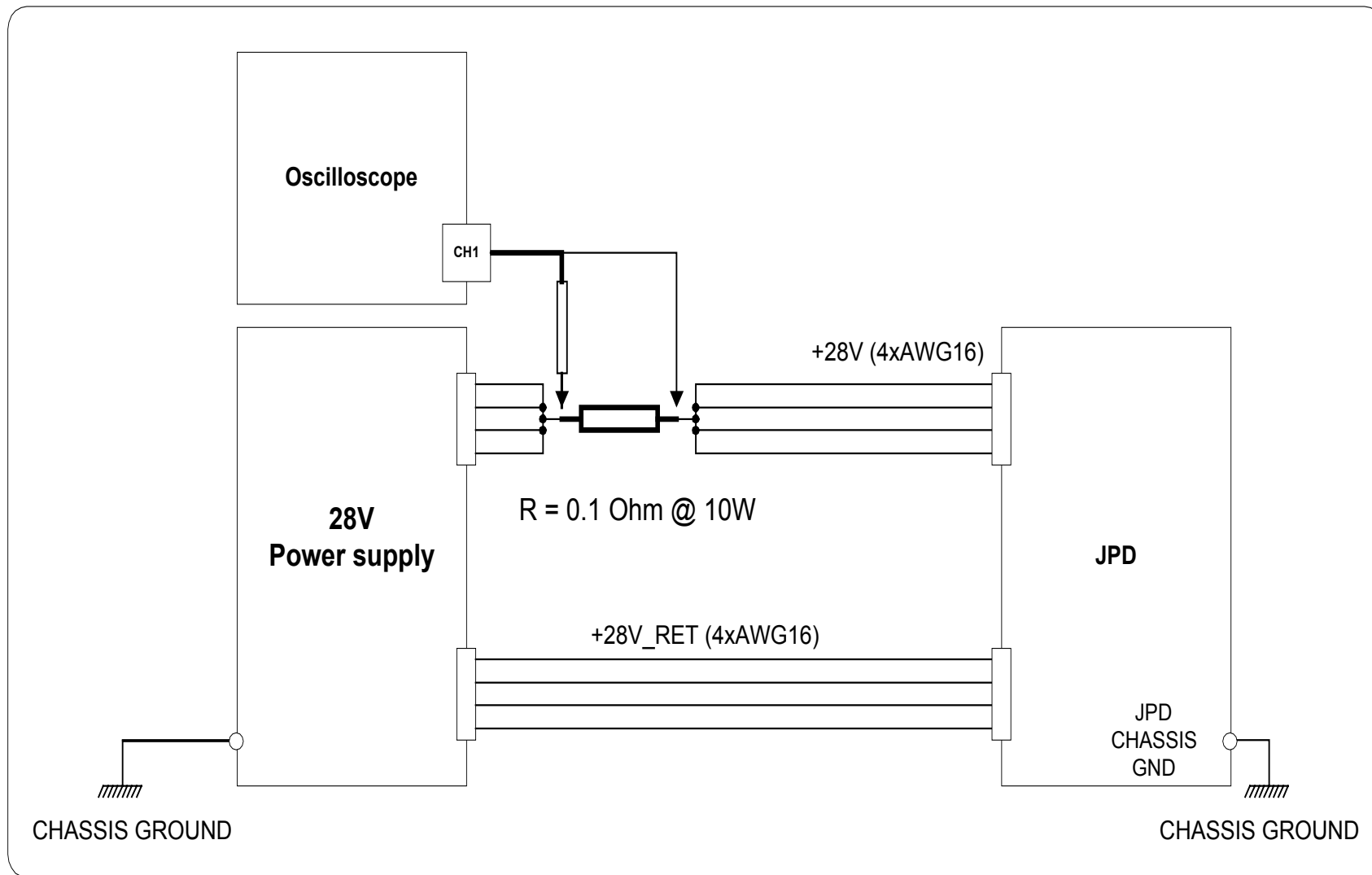


Figure 8. Inrush Current Measurement Scheme.

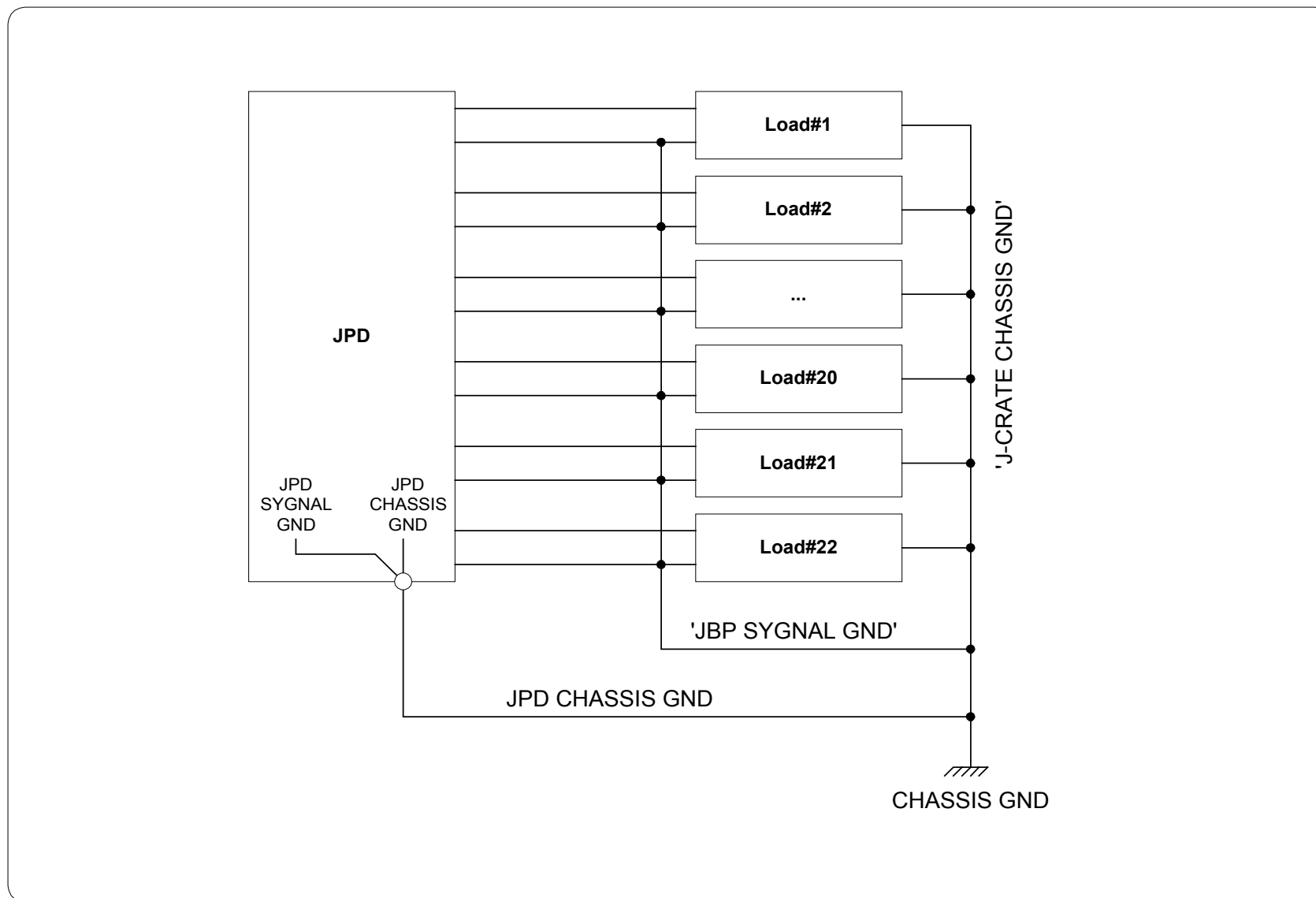


Figure 9. Grounding scheme for JPD ESS Test.

Table 1. JPD Test Matrix.

Type of test	Name of test	JPD Test Procedures										
		Power On State	Short Circuit Protection	Line Regulation	Load Regulation	Ripples Amplitude	Inrush current	CAN Bus Read Write Operations	LVDS Bus Read Write Operations	Dallas Bus Read Write Operations	Voltage Monitoring	Current Monitoring
ESS	Sine wave sweeping											
	Random Vibration test	+										
	Mechanical durability test											
	Thermal cycling test	+		+	+						+	+
TVT	Hot non-operation											
	Hot operation (thermal cycling phase)											
	Cold operation (thermal cycling phase)											
	Cold non-operation											
	Hot balance (thermal balance phase)											
	Cold balance (thermal balance phase)											
EMC	Conducted emission, CE01											
	Conducted emission, CE03											
	Conducted Susceptibility, CS01											
	Conducted Susceptibility, CS02											
	Conducted Susceptibility, CS06											
	Radiated Emissions, RE02											
	Radiated Susceptibility, RS02											
	Radiated Susceptibility, RS03PL											

Lab

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Combined tests

Table 2. Active Loads Parameters.

N	Power Source						Power Load									
	Board Name	Board Serial	Primary power supply	Secondary power supply	DC-DC Ref. Des.	Serves	Voltage at load (V)	Minimal Load (A)	Nominal Load (A)	Maximal Load (A)	Load Mode	Load Type	Load S/N	Rack Type	Rack S/N	GPIB Address
1	JPMD	02	28V-A	6031M-S03.4	U20	JMDC-0	+3.3	2.00	4.00	6.00	CC	HP60501B		HP5060A		
2				6701M-D05.1F	U22		+5.0	0.20	0.70	1.00	CC	HP60501B				
3							-5.0	0.20	0.40	0.70	CC	HP60501B				
4			28V-B	6031M-S03.4	U21	JMDC-1	+3.3	2.00	4.00	6.00	CC	HP60501B				
5				6701M-D05.1F	U23		+5.0	0.20	0.70	1.00	CC	HP60501B				
6							-5.0	0.20	0.40	0.70	CC	HP60501B				
7	JPJT	01	28V-A	6690M-S03.4F	U32	JLV1-A	+3.3	0.50	1.20	1.60	CC	HP60501B		HP5060A		
8			28V-B	6690M-S03.4F	U33	JLV1-B	+3.3	0.50	1.20	1.60	CC	HP60501B				
9			28V-A	6690M-S03.4F	U28	JINJ-0	+3.3	0.20	0.30	0.60	CC	HP60501B				
10			28V-B	6690M-S03.4F	U29	JINJ-1	+3.3	0.20	0.30	0.60	CC	HP60501B				
11			28V-A	6690M-S03.4F	U30	JINJ-2	+3.3	0.20	0.30	0.60	CC	HP60501B				
12			28V-B	6690M-S03.4F	U31	JINJ-3	+3.3	0.20	0.30	0.60	CC	HP60501B				
13	JPIF	01	28V-A	6690R-S05.5F	U18	JFOM	+5.0	0.10	0.20	0.30	CC	HP60501B		HP5060A		
			28V-B	6690R-S05.5F	U19											
			28V-A	6107R-S05.5F	U20											
14			28V-B	6107R-S05.5F	U21	JLIF	-5.2	0.60	1.20	1.50	CC	HP60501B				
			28V-A	6690R-S05.5F	U22											
15			28V-B	6690R-S05.5F	U23											
			28V-A	6690M-S05.5F	U24	J422	+5.0	0.40	0.60	0.80	CC	HP60501B				
16			28V-B	6690M-S05.5F	U25											
17	JPMD	03	28V-A	6031M-S03.4	U20	JMDC-2	+3.3	2.00	4.00	6.00	CC	HP60501B		HP5060A		
18				6701M-D05.1F	U22		+5.0	0.20	0.70	1.00	CC	HP60501B				
19							-5.0	0.20	0.40	0.70	CC	HP60501B				
20			28V-B	6031M-S03.4	U21	JMDC-3	+3.3	2.00	4.00	6.00	CC	HP60501B				
21				6701M-D05.1F	U23		+5.0	0.20	0.70	1.00	CC	HP60501B				
22							-5.0	0.20	0.40	0.70	CC	HP60501B				

N	Primary power	Type	S/N	Output Voltage (V)	Output Current
1	28V-A			28.0	5.0
2	28V-B			28.0	5.0

GPIB Address

Table 3. ADC Channel Assignment.

JPD							USCM-A (5A)	USCM-B (5B)	Active Load			Rack		
Board	S/N	Secondary power supply	DC-DC Ref. Des.	Serves	Voltage at load	Measured Parameter	ADC Channel	ADC Channel	N	Type	S/N	Type	S/N	GPiB Address
JPMD-0	00	6031M-S03.4	U20	JMDC-0	+3.3	Voltage	Ain_0	Ain_0	1	HP60501B				
						Current	Ain_4	Ain_4						
		6701M-D05.1F	U22		+5.0V	Voltage	Ain_1	Ain_1	2	HP60501B				
						Current	Ain_5	Ain_5						
					-5.0V	Voltage			3	HP60501B				
						Current	Ain_6	Ain_6						
		6031M-S03.4	U21	JMDC-1	+3.3	Voltage	Ain_2	Ain_2	4	HP60501B				
						Current	Ain_7	Ain_7						
		6701M-D05.1F	U23		+5.0V	Voltage	Ain_3	Ain_3	5	HP60501B				
						Current	Ain_8	Ain_8						
JPJT	00				-5.0V	Voltage			6	HP60501B				
						Current	Ain_9	Ain_9						
		6690M-S03.4F	U32	JLV1-A	+3.3	Voltage			7	HP60501B				
						Current	Ain_24	Ain_24						
		6690M-S03.4F	U33	JLV1-B	+3.3	Voltage			8	HP60501B				
						Current	Ain_25	Ain_25						
		6690M-S03.4F	U28	JINJ-0	+3.3	Voltage			9	HP60501B				
						Current	Ain_20	Ain_20						
		6690M-S03.4F	U29	JINJ-1	+3.3	Voltage			10	HP60501B				
						Current	Ain_21	Ain_21						
		6690M-S03.4F	U30	JINJ-2	+3.3	Voltage			11	HP60501B				
						Current	Ain_22	Ain_22						
JPIF	00	6690M-S03.4F	U31	JINJ-3	+3.3	Voltage			12	HP60501B				
						Current	Ain_23	Ain_23						
		6690R-S05.5F	U18	JFOM	+5.0	Voltage	Ain_26	Ain_26	13	HP60501B				
						Current	Ain_29	Ain_29						
		6107R-S05.5F	U20		-5.2	Voltage	Ain_27	Ain_27	14	HP60501B				
						Current	Ain_30	Ain_30						
		6690R-S05.5F	U22	JLIF	+5.0	Voltage	Ain_28	Ain_28	15	HP60501B				
						Current	Ain_31	Ain_31						
		6690R-S05.5F	U23											
		6690M-S05.5F	U24	J422	+5.0	Voltage			16	HP60501B				
						Current								
		6690M-S05.5F	U25											
JPMD-1	01	6031M-S03.4	U20	JMDC-2	+3.3	Voltage	Ain_10	Ain_10	17	HP60501B				
						Current	Ain_14	Ain_14						
		6701M-D05.1F	U22		+5.0V	Voltage	Ain_11	Ain_11	18	HP60501B				
						Current	Ain_15	Ain_15						
					-5.0V	Voltage			19	HP60501B				
						Current	Ain_16	Ain_16						
		6031M-S03.4	U21	JMDC-3	+3.3	Voltage	Ain_12	Ain_12	20	HP60501B				
						Current	Ain_17	Ain_17						
		6701M-D05.1F	U23		+5.0V	Voltage	Ain_13	Ain_13	21	HP60501B				
						Current	Ain_18	Ain_18						
					-5.0V	Voltage			22	HP60501B				
						Current	Ain_19	Ain_19						

Table 4. List of JPD specific test equipment.

N	Equipment	Quantity	Model / OS Type	Manufacturer	Who will provide
1	28V power supply	2	HP6038A	H-P	CSIST
2	Oscilloscope	1	TDS2000 series	Tektronix	CSIST
3	Active load	22	HP50601B	H-P	CSIST
4	Rack for active loads	4	HP5060A	H-P	CSIST
5	CAN-Bus interface (for PC)	1	EPP-CAN Box	MIT	MIT
6	GPB interface (for PC)	1	JPIB-USB-B	Nat. Inst.	NCU
7	Personal Computer	1	Linux	IBM	MIT
8	Personal Computer	1	Windows	Compaq	NCU
9	GPB cable	5	1.2m	Nat. Inst.	CSIST+NCU
10	CAN Bus Cable	1	5.0m	MIT	MIT
11	IEEE1284 cable	1	1.5m	MIT	MIT